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Edaphic Relationships in Climax Singleleaf Pinyon Stands of Western Nevada

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ABSTRACT

We examined soil series and soil properties that are associated with climax singleleaf pinyon (Pinus monophylla) *stands in western Nevada. This information is useful in inventorying woodland and range resources and in land use planning. We used the Soil Resource Information System Program to evaluate and test soil properties associated with singleleaf pinyon. Soils supporting singleleaf pinyon stands commonly had mollic epipedons, argillic horizons, shallow depth to bedrock, mesic temperature regimes, and low available water capacities. The 11 soil series associated with climax stands of singleleaf pinyon stands occur on 7 percent of the land surface (approximately 188,000 acres) in western Nevada. These soils have low potential for forage production and are best suited for producing wood products.*

KEYWORDS: soils, plant-soil relationships, woodlands

INTRODUCTION

Our objectives were to determine the kinds of soils on which climax stands of singleleaf pinyon (*Pinus monophylla*) occur in western Nevada and to make interpretations about important soil properties that are associated with pinyon stands. Data from four published soil surveys for western Nevada were used as the data base. We obtained information on the relationship between soil and vegetation from the Soil Resource Information System[2] (SRIS). This report includes descriptions of soil series and soil properties associated with singleleaf pinyon and provides management implications.

METHODS

Soil and vegetation information from the SRIS program on the Fort Collins Computer System 2000 identified soils and soil properties associated with climax stands of singleleaf pinyon. Order III soil surveys from four survey areas (Carson City, Douglas, Lyon, and Washoe County-south part—2,780,672 acres) in western Nevada were used as the data base.

Information about mollic epipedons, argillic horizons, soil temperatures, soil depth to bedrock, rock fragment content, pH, clay content, parent material, and available water capacity was evaluated for each soil series associated with climax singleleaf pinyon stands. We analyzed understory components of the vegetation for constancy (percentage occurrence) among the soil series.

RESULTS AND DISCUSSION

We found 11 soil series regularly associated with climax singleleaf pinyon stands in western Nevada. Taxonomic classifications for these soil series are presented in table 1. These soils are on ridges, side-slopes, and pediments of numerous mountain ranges and occupy approximately 188,300 acres or 7 percent of the land surface in the soil surveys. Soil series associated with singleleaf pinyon belong in the Mollisol, Aridisol, and Entisol orders (USDA Soil Conservation Service 1975). Texture varies from loamy to clayey and soils are commonly skeletal (greater than 35 percent rock fragments).

Soil properties associated with these soil series are given in table 2. The soils have a mollic or argillic horizon and usually both. Soil temperature regimes are mesic (mean

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[2] SRIS, Soil Resource Information System, was cooperatively developed by Colorado State University, Soil Conservation Service, Agricultural Research Service, and Laboratory Information Science in Agriculture on the USDA Fort Collins Computer System 2000.

Table 1—Soil series and families associated with climax stands of singleleaf pinyon in western Nevada

Soil series	Soil family[1]
Berit	Loamy-skeletal, mixed, mesic, shallow, Xerollic Haplargids
Cagle	Fine, montmorillonitic, mesic, Aridic Argixerolls
Duco	Clayey, montmorillonitic, mesic, Lithic Argixerolls
Hyloc	Clayey, montmorillonitic, mesic, shallow, Aridic Argixerolls
Itca	Clayey-skeletal, montmorillonitic, frigid, Lithic Argixerolls
Koontz	Loamy-skeletal, mixed, mesic, shallow, Aridic Argixerolls
Kram	Loamy-skeletal, carbonatic, mesic, Lithic Xeric Torriorthents
Minneha	Loamy-skeletal, mixed, mesic, shallow, Aridic Haploxerolls
Nall	Loamy, mixed, mesic, shallow, Aridic Haploxerolls
Searles	Loamy-skeletal, mixed, mesic, Aridic Argixerolls
Wile	Clayey, montmorillonitic, mesic, shallow, Aridic Argixerolls

[1] Soil descriptions follow Soil Conservation Service (1975).

Table 2—Characteristics of soils supporting climax stands of singleleaf pinyon in western Nevada

Soil series	Mollic[1] epipedon	Argillic horizon	Temperature regimes		Depth to bedrock		Range in available water capacity	
			Mesic	Frigid	20	>20	Low	High
					- - - - - - - - *Inches*		- - - - - - - -	
Beri	[2]—	X	X		X		[3]0.47	0.64
Cagle	X	X	X			X	3.02	3.47
Duco	X	X	X		X		1.46	1.77
Hyloc	X	X	X		X		1.76	2.36
Itca	X	X	—	X	X		1.65	1.99
Koontz	X	X	X		X		1.30	1.58
Kram	—	—	X		X		1.00	1.21
Minneha	X	—	X		X		1.08	1.37
Nall	X	—	X		X		.48	.64
Searles	X	X	X			X	3.68	4.44
Wile	X	X	X		X		1.89	2.34

[1] Definitions of epipedons, horizons, temperature regimes, and available water capacity are too lengthy for inclusion in the table or text. The reader is referred to the Soil Conservation Service (1975).

[2] X denotes the presence and - the absence of soil characteristic in the soil series.

[3] Total water capacity for the entire profile.

annual soil temperatures are 46 to 59 °F with one exception). Depth to bedrock is less than 20 inches for all soil series except Cagle and Searles series, which have deeper soils. There is no consistency in pH (6.3 to 7.8) and clay content (4 to 50 percent) among soil series. Parent materials of the 11 soil series were varied (four granitic, six volcanic, and one limestone). Rock fragment content was less than 35 percent in five soil series and greater than 35 percent (skeletal soils) in six others.

Forage production of the understory in closed singleleaf pinyon stands is generally less than 50 lb/acre, dry weight. Removal of trees can increase production to 600 lb/acre, but production is site specific and dependent upon soil, slope, aspect, precipitation, and plant species present (personal communication, Ken Genz, Toiyabe National Forest). In a case study in central Nevada, forage production increased from 25 to 27 lb/acre on a south slope, 23 to 345 lb/acre on a west slope, and 56 to 197 lb/acre on a north slope following tree removal from closed stands (Everett and Sharrow 1985). Forage production can be much higher (800 to 1,100 lb/acre) on associated soils such as the Nosrac series that occurs in some of the same mapping units with woodland soils (Candland 1981). The Nosrac soil has a mollic epipedon and an argillic horizon but greater depth to bedrock (60 inches) and more available water capacity in the entire profile (6.18 to 7.2 inches).

Understory associated with climax singleleaf pinyon stands was mostly shrubs: Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), low sagebrush (*Artemisia arbuscula*), black sagebrush (*Artemisia nova*), and antelope bitterbrush (*Purshia tridentata*). Bitterbrush had the highest constancy (80 percent) among the soil series.

MANAGEMENT IMPLICATIONS

Soils associated with climax stands of singleleaf pinyon have low potential to produce significant amounts of forage. Vegetation type conversions such as chaining, burning, clearcutting, or herbicide spray have had little success on these soils. Conversion treatments may result in a minor release of sagebrush and bitterbrush species to benefit wildlife. We suggest these soils are best used and managed to provide wood products. Firewood, fenceposts, pinenuts, and Christmas trees are valuable resource products, and demand for these products has increased dramatically in the last decade.

SUMMARY

Climax singleleaf pinyon stands occur on soils of low potential for producing forage. Shallow soil and rock fragments limit available water capacity. Remnant understory vegetation (mostly shrubs) cannot be expected to be very productive following tree removal because of site constraints. Wood production should be the primary use for these soils.

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